R E M A R K S

Reconsideration of this application, as amended, is respectfully requested.

ALLOWABLE SUBJECT MATTER

The Examiner's indication of the allowability of the subject matter of claims 6-9 and 18-21 is respectfully acknowledged.

These claims, however, have not been rewritten in independent form at this time since, as set forth in detail hereinbelow, it is respectfully submitted that their respective parent claims 1 and 13 also recite allowable subject matter.

THE PRIOR ART REJECTION

Claims 1-5, 10-17 and 22-24 were rejected under 35 USC 102 as being anticipated by USP 6,099,103 ("Takahashi"). This rejection, however, is respectfully traversed.

The Examiner asserts on page 2 of the Office Action that the signal B of Takahashi is a micro-vibration pulse as recited in claims 1 and 13, and that pulse width T of Takahashi is the same as pulse width (2n)AL as recited in claims 1 and 13.

As explained in more detail hereinbelow, however, signal B of Takahashi is a droplet downsizing pulse that does not correspond to a micro-vibration pulse, and T in Takahashi actually corresponds to AL (acoustic length) as recited in

claims 1 and 13. Therefore, it is respectfully submitted that Takahashi actually discloses a droplet downsizing pulse B having a maximum pulse width of 1AL (1.0 T), and that Takashi does not disclose, teach or suggest the features of the claimed present invention as recited in independent claims 1 and 13.

According to the present invention as recited in claim 1, a droplet ejection apparatus is provided which comprises: a drive signal generator for generating a set of drive signals including a plurality of drive pulses; a drive pulse selector for selecting a set of drive pulses in accordance with a print datum of each pixel; and a head for ejecting a droplet from a nozzle provided corresponding to a channel, by changing a volume of the channel according to the set of drive pulses selected. As recited in claim 1, moreover, the drive signal includes a micro-vibration pulse as one of the drive pulses to generate a micro-vibration of meniscus in the nozzle in such a degree that the droplet is not ejected, wherein the micro-vibration pulse is formed of a rectangular wave which include at least one micro-vibration pulse having a pulse width of (2n) AL, where AL is 1/2 of the acoustic resonance period of the channel, and n is an integer not smaller than 1.

Similarly, according to the present invention as recited in independent method claim 13, a drive method for a droplet

ejection head is provided which comprises: generating a set of drive signals including a plurality of drive pulses by a drive signal generator; selecting a set of drive pulses in accordance with a print datum of each pixel by a drive pulse selector; ejecting a droplet by changing a volume of a channel according to the set of drive pulses selected, from a nozzle of the droplet ejection head, the nozzle being provided corresponding to the channel. And as recited in independent claim 13, a micro-vibration pulse is applied onto the droplet ejection head to generate a micro-vibration of meniscus in the nozzle in such a degree that the droplet is not ejected, wherein the drive signal includes a micro-vibration pulse as one of the drive pulses to generate a micro-vibration of meniscus in the nozzle in such a degree that the droplet is not ejected, and the micro-vibration pulse is formed of rectangular waves which include at least one micro-vibration pulse having a pulse width of (2n)AL, where AL is 1/2 of the acoustic resonance period of the channel, and n is an integer not smaller than 1.

Thus, according to the present invention as recited in each of independent claims 1 and 13, a micro-vibration pulse is applied to generate micro-vibration of ink in the nozzle and includes at least one micro-vibration pulse having a width of (2n)AL. With this structure, the meniscus can be effectively vibrated and the residual vibration generated by vibrating the

meniscus can be canceled out. Therefore, with the structure of the claimed present invention, the liquid in the nozzle can be effectively stirred even under conditions of low humidity and low temperature and the ink droplet can still be stably ejected.

By contrast, according to Takahashi, the signal B is a droplet downsizing pulse that is applied to a channel of a nozzle after a jet pulse signal A is applied to eject an ink droplet from the nozzle. According to Takahashi, the droplet downsizing signal B functions to reduce the size of the droplet that is ejected from the nozzle. Thus, Takahashi does not disclose a micro-vibration pulse, but rather discloses a pulse applied after the droplet ejecting pulse is applied, so as to limit a size of the droplet.

Significantly, Takahashi discloses that the droplet ejecting pulse has a pulse width of 0.2-0.4T (see Figs. 2-4 thereof) or 0.3-1.0T (see Fig. 5 thereof). And it is respectfully pointed out that "T" according to Takahashi corresponds to "AL" as recited in claim 1.

That is, T according to Takahashi is L/a, where L is the channel length and a is the sonic velocity of the ink. In other words, Takahashi discloses that T is the length of time it takes a pressure wave to propagate one way through the ink chamber. Similarly, the acoustic length (AL) according to the present

invention as recited in independent claims 1 and 13 is 1/2 of the acoustic resonance period of the channel. Thus, AL of the claimed present invention corresponds to T in Takahashi.

It is respectfully pointed out, moreover, that even if Takahashi did disclose a micro-vibration pulse, Takahashi still does not disclose any pulse (let alone a micro-vibration pulse) having a width as long as 2T (or 4T, etc.). Therefore, it is respectfully submitted that Takahashi does not at all disclose, teach or suggest a micro-vibration pulse width of (2n)AL, where AL is 1/2 of the acoustic resonance period of the channel, and n is an integer not smaller than 1, as according to the present invention as recited in independent claims 1 and 13.

In view of the foregoing, it is respectfully submitted that independent claims 1 and 13, as well as claims 2-12 and 13-24 respectively depending therefrom, all clearly patentably distinguish over Takahashi, under 35 USC 102 as well as under 35 USC 103.

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Entry of this Amendment, allowance of the claims and the passing of this application to issue are respectfully solicited.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

Respectfully submitted,

/Douglas Holtz/

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